

$$\begin{aligned}x &= r \cdot [9.99521] \cdot \sin(v + 9^\circ 6' 2'') \\y &= r \cdot [9.98774] \cdot \sin(v + 277^\circ 2' 4'') \\z &= r \cdot [9.44252] \cdot \sin(v + 130^\circ 17' 5'')\end{aligned}$$

r being the radius-vector, and v the true anomaly.

[Mr. Gill writes on September 19: "Yesterday and to-day the comet is a brilliant daylight object, and was observed on the meridian by myself with the Transit Circle. We have a whole lot of Alt-Azimuth observations which will be reduced as soon as possible. They were the only kind of observations possible, as the comet was only visible by glimpses through holes in the cloud between September 8 and perihelion."

In a letter addressed on the same day to the Astronomer Royal (with a copy of which he has favoured us) Mr. Gill says: "On Sunday, the 17th inst., the comet was followed by two observers with separate instruments right up to the sun's limb, where it suddenly disappeared at 4h. 50m. 58s. Cape M.T."]

NOTES

PROBABLY some of our readers may have heard that Mr. W. Spottiswoode met with an accident recently. The fact is that on September 30 last he broke his left humerus within the capsule, through the overturning of the tricycle he was riding. He has, we are glad to learn, been carefully attended, and is getting on as well as possible.

A PRIVATE letter to this country conveys the intelligence of the death, on September 11, at Kandy, of Dr. Thwaites, F.R.S., for many years director of the Royal Botanic Gardens, Peeadeniya, Ceylon. We shall defer to a future issue some particulars of his life.

THE death is announced, at the early age of forty-eight years, of the well-known scientific photographer, Dr. D. Van Monckhoven.

WE are glad to learn that a memorial signed by Professors Paget, Humphry, Hughes, Newton, and Moseley, Drs. Michael Foster and S. H. Vines, and Messrs. G. H. Darwin, E. W. Blore, Coutts Trotter, A. Sedgwick, and J. W. Clark, was presented to the Vice-Chancellor of Cambridge University (Dr. Porter) on the 4th inst., representing the desirability of establishing some memorial of the late Prof. Balfour in the University. The Vice-Chancellor, in accordance with this request, has called a meeting of Members of the Senate and others for October 21, at 4.30 p.m., in the Lecture-Room of Comparative Anatomy, in the New Museums, "to take steps to establish in the University a memorial of the late Prof. Balfour."

SOME forty eminent German botanists met at Eisenach on September 16, under the presidency of Professors Pringsheim, Cramer, and Willkomm, and founded a German Botanical Society. The new society has its seat at Berlin, and its object is to form an effective and supporting centre for all efforts in the domain of scientific botany in Germany.

As is well known, the French Institute is divided into five classes, which meet together once every year. The president of this reunion is chosen in rotation from among the president of each of the five sections. The chair will be occupied this year by the president of the Academy of Sciences, who is styled director, and who happens to be M. Dumas, one of the two perpetual secretaries of the Academy of Sciences. M. Dumas will deliver on this occasion an address which it is stated will be of special importance. This meeting will take place on October 25 next.

M. DUMAS delivered at the sitting of the Academy of Sciences of October 9 an address summarising the works of the International Commission of Weights and Measures. He stated that the commissioners had executed a comparison between the

original meter and kilogramme deposited in the Archives, with the new standards. The difference had been proved to be 0.000005m. for the meter, and 0.00001 gram for the kilogramme. The consequence is that a slight correction will be required for the measures taken with the international meter as the comparison between two measures of length can be executed with a precision of one part in ten millions. The new international kilogramme can be used without any correction at all.

Two International Conferences will open in Paris on Monday next. One of these is for the object of settling upon a plan for the protection of sub-marine telegraph cables; the other is to establish throughout Europe the important desideratum of technical uniformity in relation to electricity. England, France, Germany, Austria, the United States, Spain, Denmark, Norway, and Sweden will be represented.

M. GABRIEL DE MORTILLET, Professor of Archaeology to the School of Anthropology of Paris, has just published through Reinwald a work under the title of "*Le Præhistorique*," which may be considered as the first complete manual for the study of the Archaeological Museum of St. Germain. M. Gabriel de Mortillet has been attached to this establishment from its foundation by Napoleon III. up to the present time, and is industriously engaged in its completion. The author, who is one of the few living geologists who investigated the formation of glaciers in Switzerland with Agassiz, attempts at the end of his volume to determine how far distant is the epoch when *Homo Sapiens* made his first appearance on the earth, by estimating the rate of progression of blocks which were carried by former ice-fields, and he comes to the conclusion that the space of time that has elapsed since that event to the present exceeds 200,000 years.

THE meteorological station on the summit of the Säntis has recently been opened, and this latest Swiss station promises to be of importance with regard to the progress of meteorological science. In its altitude of 2504 metres it is surpassed only by the observatories on the Stelvio (2548 metres), the Pic du Midi in the Pyrenees (2877 metres), and the station upon the Colorado Peak (4340 metres).

THE *Panama Star and Herald* of September 14 gives details of several earthquake shocks which had visited the isthmus during the preceding week, doing much damage, but, fortunately, only causing two deaths. At 3.20 a.m. on Thursday, the 7th, the inhabitants were aroused from their beds by one of the longest and most severe earthquake shocks ever experienced in the city. It was preceded by a hollow, rumbling noise. The motion was wave-like, and proceeded almost directly from north to south. The first and most severe shock must have lasted at least 30 seconds. Extreme damage was done to buildings. A second and milder shock occurred about half an hour after the first. The Pacific Mail steamship *Clyde*, arriving from San Francisco, reported that the earthquake was severely felt on board. Passengers declared that it appeared as if the vessel were lifted bodily from the sea and allowed to fall back. The effects of the earthquake along the railroad were most marked. The stone abutments of several of the bridges were cracked and almost split, and the earthworks sank in half a dozen places. In several places where the direct action of the shock appears to have made itself most strongly felt, the rails were curved as if they had been intentionally bent. The severe shock on the morning of the 7th was followed during the day by several others of less intensity, and at 11.30 p.m. a sharp shock alarmed the whole city, and drove the people from their houses to the squares. Another slighter shock occurred at about three in the morning; but, fortunately, neither it nor its predecessor added further ruin to that already incurred in the city. All the shocks were felt on the islands in the bay, and some houses suffered at Taboga. On the morning of the 7th, at about 3.15, the residents of Colón

were aroused by the earthquake shock which has caused so much alarm and damage to the whole isthmus. The duration of the shock was fully 60 seconds, and was so severe that the whole populace rushed into the streets as rapidly as their feet could carry them. About half an hour afterwards another shock was felt, but much lighter than the first. A deep fissure was opened in the earth from the south end of the freight-house for a distance of about 400 feet along the walk leading in the direction of the ice-houses. Many buildings were moved slightly from their foundations, but on the whole remarkably little damage was done. On board the vessels in the harbour the shock was also felt very severely. About 1 p.m. another much slighter shock was felt, and during the succeeding night two more slight disturbances were reported. It may be of meteorological interest to observe that the sea at the time remained calm, the atmosphere quite clear, and the stars and waning moon remarkably brilliant. Soon after, say about 4 o'clock, a slight fog wafted from inland; no rain fell. All day an ominous calm prevailed without rain, with fluctuating barometer and excessive heat. Another slight shock occurred at Panama on the morning of the 9th, a little before 5 o'clock, but fortunately no damage was done. The same shock was lightly felt in Colon and along the railroad track. All day on Saturday no shock was felt, and the night passed quietly. At mid-day on Saturday, there was a marked change in the atmosphere, and, with a refreshing shower which fell, the murky, sultry air of the previous days entirely disappeared. The rumours of a volcanic eruption at Chagres are entirely without foundation. The earthquake was felt there, did some little damage, and opened a few cracks in the ground. The earthquake of the 7th was felt at the Pearl Islands, in the bay. At Donoso, Govea, and Rio Indio a number of shocks were felt, and the people were much frightened. At Miguel la Borda, 35 miles from Colon, in the direction of Bocas del Toro, the tide rose to an unusual height and flooded some of the houses, which are built on the beach almost on a level with the sea. The earth sank in about a dozen places. The Governor of the district writes officially that several boiling springs suddenly appeared, some of which throw hot water to a considerable height. Letters have been received from the towns of La Villa, Chitré, Macaracas, ann Natá, all in the State, announcing that several shocks have been felt, but that the material of which the houses are built—bamboos and adobes—resisted the movements, and they suffered no damage. Two or three slight tremblings were experienced in Panama during the night of the 12th, but they caused no alarm, and many people were returning to their houses.

In the Photographic Exhibition, which was opened in Pall Mall on Monday, there are several pictures of more than artistic interest. We may mention especially Captain Abney's views taken on the Alps, and showing the great difference in the photographic quality of the light reflected from the sky at high altitudes (9,000 to 10,000 feet), and that reflected at lower levels. Mr. Grant's photographs taken on board Mr. Leigh Smith's yacht *Eira* during her cruise to Franz Josef Land in 1880, are also of interest, as is also Mr. Shadbolt's photograph taken from the car of a balloon at the height of 2,000 feet, showing the streets and houses below.

THE Council of the Statistical Society have again decided to grant the sum of 20*l.* to the writer who may gain the "Howard Medal" in 1883. The subject is—"The best exposition of the experiences and opinions of John Howard on the preservation and improvement of the health of the inmates of schools, prisons, workhouses, hospitals, and other public institutions, as far as health is affected by structural arrangements relating to supplies of air and water, drainage, &c." Candidates are referred to the text and foot-notes of Howard's two works on "Prisons" and "Lazarettos."

BOTANISTS will learn with satisfaction that the Cavaliere d'Amico has succeeded, not without considerable difficulty, in acclimatising a number of foreign plants in Sicily. They are being exhibited at the present moment at the Agricultural Exhibition of Messina, and excite a great deal of interest among the spectators. Amongst them are the tea plant, *Persea gratissima*, *Cinchona succirubra*, *Indigofera tinctoria*, and *Myrica cerifera*. Cav. d'Amico intends to establish a tea plantation of some extent not far from Messina, and it is hoped that Sicilian tea may in a few years become an important article of commerce.

In a vineyard at Bonn, Phylloxera have recently made their appearance. The necessary precautions were at once taken.

THE eminent Berlin sculptor, Herr Pohle, is now about to complete a bust of the celebrated geographer, Karl Ritter, for the Geographical Society of Berlin.

PROF. SIMON NEWCOMB, of Washington; Lieut. T. L. Casy, United States Army; Ensign J. H. L. Holcombe, United States Navy; and Mr. Julius Ulke, forming the expedition despatched by the Government of the United States to observe the transit of Venus at the Cape, left Plymouth last Friday in the Union Steamship Company's mail steamer *Durban*. Miss Newcomb, daughter of the Professor, the lady member of the expedition, is in London, the epidemic of smallpox at the Cape deterring her from proceeding with her father. Mr. Gill, the Astronomer Royal at the Cape, has expressed his willingness to render the members of the expedition every facility as to the selection of a station by collecting information. It is probable that Beaufort, which is 300 miles from Cape Town, will be chosen, from the fact that in that district there is proverbially a clear sky.

THE Danish astronomers, who have been selected to take observations of the transit of Venus, have left Copenhagen for Santa Cruz.

ON commencing his Winter course of lectures on Comparative Anatomy at King's College, Prof. Jeffery Bell made the following remarks:—"In ordinary circumstances it is well to proceed at once to the work before us, but, during the six months that have elapsed, since I last addressed a class of comparative anatomy from this chair, two heavy blows have fallen on the students of zoological science; the two most remarkable of English workers have been taken away from us, the one full of years and honours, the other the bearer of a glorious promise. I should not be doing my duty if I were not to ask you to pause for a moment on the threshold of your studies to bear witness with me to the regrets which we justly feel at the death of Charles Darwin, and the sense of irreparable loss which is connected with the name of F. M. Balfour. The father of modern zoology, the reformer of all our conceptions as to the workings of nature in the organic world, the assiduous and patient collector of the facts of natural history, the prince of observers and the leader of philosophical naturalists was carried to his grave in our national burying place amid the mourning of the whole civilised world; the broad outline of his work is well known to you all. On the treacherous slopes of an ice-bound mountain, away from kindred and friends, save such as his character had won for himself in an Alpine village, and yet always in the minds of those who knew him, Francis Balfour in, as we may be assured a moment of time, yielded up a life of which only thirty years had been spent, and lost to science and society what had promised to be as many years and more of patient and far-seeing investigation, free from prejudice, animated by the most scientific and philosophical of ideas while he himself, urged on by the success of the past, would have sought only fresh fields of victory in the future. It would be useless to point out in detail here, where so many are only beginners, the special services of Prof. Balfour, but you will note that his name will be constantly quoted during this course,

as the discoverer of facts which have often thrown unexpected light on the problems of our science, and have always, at least, been of the highest importance, and stated with admirable truth and modesty."

THE *Annales de Chimie et de Physique* reproduces in its August number a paper relating to the theory of dissipation of energy, read by Macquorn Rankine at the British Association meeting in 1852.

A SERIES of scientific ascents were made on Sunday afternoon from the Place Saint Jacques, in Paris, under the auspices of the Académie d'Aérostation Météorologique. At a height of eight hundred feet photographs of the entire horizon were taken by means of a panoramic apparatus invented by M. Triboulet. In a brief explanation of this, given by one of the members of the Academy, it was pointed out that the experiment was as important from a military as from a scientific point of view, since it would enable an army to ascertain exactly the number and position of their enemies. At another ascent telephonic conversation with persons on the ground was carried on at the height of five hundred feet. The experiments were under the auspices of the Municipal Council of Paris.

THE aurora borealis which was seen in so many parts of England on October 2, was also visible in France from a very large number of places.

M. DUVAUX, the French Minister of Public Instruction, has opened the first superior school for females established in France. It is situated in the city of Rouen, and the regular course of study will begin this year. Many similar establishments are in course of construction in several parts of the country.

THE additions to the Zoological Society's Gardens during the past week include a Sykes's Monkey (*Cercopithecus albicularis* ♀) from East Africa, presented by Capt. F. W. Schwedler; a Binturong (*Arctictis binturong*) from Malacca; a Common Fox (*Canis vulpes* ♀), British, presented by Mrs. Studholme Brownrigg; two Goshawks (*Astur palumbarius*) from Germany, presented by Dr. Rudolph Blasius, C.M.Z.S.; a Common Raven (*Corvus corax*), two Lesser Black-backed Gulls (*Larus fuscus*) from Scotland, presented by Mr. F. G. Bury; two Greater Sulphur-crested Cockatoos (*Cacatua galerita*) from Australia, presented by Mr. C. Kerry Nicholls, F.Z.S.; a Puff Adder (*Vipera arietans*) from South Africa, presented by Lieut. R. Crawshaw; an Ornamented Lorikeet (*Trichoglossus ornatus*) from Moluccas, a Crested Curassow (*Crax alector*) from Guiana, two Illiger's Macaws (*Ara maracana*) from Brazil, purchased; two Brazilian Hangnests (*Icterus jamaicai*) from Brazil, deposited; an Australian Fruit Bat (*Pteropus poliocephalus*), born in the Gardens.

CHEMICAL NOTES

AN exceedingly ingenious patent for the manufacture of hydrogen and oxygen has been taken out by M. N. A. Héroult, of Paris. Wood charcoal is obtained by heating wood in closed vessels: the gas which is evolved is used for heating the retorts in which hydrogen and oxygen are produced, the tar is used for carburetting hydrogen, the pyroligneous acid is employed to decompose sodium sulphite (produced in another stage of the process), whereby sulphurous acid and sodium acetate are obtained. By passing steam over hot wood charcoal, a mixture of hydrogen, carbon monoxide, and dioxide is obtained; the mixed gases are passed into retorts containing heated gypsum, which is reduced by carbon monoxide to calcium sulphide; the escaping carbon monoxide is absorbed by soda solution, giving sodium bicarbonate. Oxygen is obtained by decomposing gypsum (600 parts) by silica (340 parts river sand); the mixture of sulphur dioxide and oxygen which is produced, is passed into caustic soda solution, whereby sodium bisulphite is formed; the residual sulphur dioxide is absorbed by milk of lime. The calcium sulphite produced by the final washing of the mixed gases is decomposed by sodium bicarbonate, giving calcium carbonate

and sodium bisulphite; the latter is decomposed, as already described, by pyroligneous acid, and the sulphurous acid produced is oxidised to sulphuric acid in a cylinder containing platinised pumice-stone, by air containing 75 per cent. of oxygen. The calcium sulphide which remains in the oxygen retorts is decomposed by carbon dioxide and steam; the sulphuretted hydrogen produced, after being freed from moisture by passing through a condensing apparatus, is burned with air rich in oxygen, and the sulphurous acid formed is conducted into the leaden chambers of the sulphuric acid manufactory. Air containing 75 per cent. oxygen is obtained by pumping air into a cylinder containing a mixture of 80 parts water and 20 parts glycerine; when the pressure has reached 10 atmospheres, communication is made between the first cylinder and another from which air has been removed; air rich in nitrogen remains in the first cylinder. By repeating this operation, a mixture of 75 per cent. oxygen and 25 per cent. nitrogen can be obtained. Another method of obtaining nearly pure oxygen from air consists in passing the latter into an iron cylinder containing a bag of silk covered with caoutchouc; the dialysed air is then driven by a steam jet into a condenser, and thence passes into a second similar cylinder; this process is repeated several times; a mixture of 98 per cent. oxygen and 3 per cent. nitrogen may thus be obtained, but for most metallurgical or lighting purposes a mixture containing 60 per cent. oxygen is sufficient. Nitrogen escapes from each iron cylinder by a side tube which dips under water. The silk bags used for dialysing air are prepared by washing ordinary caoutchouc with a mixture of carbon disulphide and alcohol (whereby substances are removed which would readily stop the pores of the caoutchouc-covered silk) making into a paste with benzene, and placing a layer of this between two layers of silk.

IN the *Scientific Proceedings* of the Ohio Mechanics' Institute (i. 35) a process is described for melting iridium by heating in a Hessian crucible with phosphorus, and subsequent renewal of the phosphorus by repeated fusion with lime. The metal, in very thin sheets, can be cut by a copper wheel making 2000 revolutions per minute, and having its surface covered with emery, or corundum, and oil. Metallic iridium is nearly as hard as ruby; no steel tools make any impression on it; attempts have been made, with fair success, to use it in place of carbon as the negative pole in the electric arc light.

IT is stated in the *Chemical Review* that recent analyses of the water from the *Holy Well* at Mecca, which is so eagerly drunk by pilgrims, show this water to be sewage, about ten times stronger than average London sewage.

ARTIFICIAL ivory of a pure white colour, and very durable has recently been manufactured by the inventor of celluloid: it is prepared by dissolving shellac in ammonia, mixing the solution with oxide of zinc, driving off ammonia by heating, powdering, and strongly compressing in moulds.

ON THE ALTERATIONS IN THE DIMENSIONS OF THE MAGNETIC METALS BY THE ACT OF MAGNETISATION¹

DR. JOULE long since discovered that when a bar of iron was magnetised by an electric current, an *elongation* of the bar took place. In subsequent experiments, published in 1847, Joule found that the elongation amounted to about 1-200,000th of the length of the bar for the maximum magnetisation, and that the total elongation was nearly proportional to the square of the actual magnetisation. By placing the bar in a vessel of water stopped with a capillary tube, it was found that the volume of the iron did not augment, and hence Joule concluded that the sectional area diminished in proportion to the elongation. Under longitudinal tension, magnetisation caused a *shortening* of the rod when the tension exceeded 600 lbs. for a rod a quarter of an inch square. Soft steel behaved like iron; but hard steel, under all circumstances, Joule found to shorten slightly when the magnetising current passed.

In 1873 Prof. Mayer repeated Joule's experiments with new and delicate apparatus; the elongation of the iron he found to amount to 1-277,000th of its length for the maximum magnetisation. Mayer also found that soft as well as hard steel contracted under magnetisation.

¹ Paper read at the Southampton Meeting of the British Association by Prof. W. F. Barrett, F.R.S.E., Professor of Physics in the Royal College of Science, Dublin.